

Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of

The Establishment of Policies and Service
Rules for the Non-Geostationary
Satellite Orbit, Fixed Satellite Service
in the Ka-Band

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IB Docket No. 02-19

REPLY COMMENTS OF SKYBRIDGE

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SUMMARY

In the instant NPRM, the Commission proposed four alternative frameworks for NGSO/NGSO sharing in the Ka-band. The comments in this proceeding demonstrate that only Option III squarely meets all of the Commission's stated objectives. As noted by the majority of the commentors, Option III provides the most effective and efficient means for sharing among the proposed systems. The option leaves all operators free to use all of the spectrum for as much of the time as possible, requiring mitigation measures only during "in-line" events. Option III also permits technology and service choices to be dictated by the market, not by the Commission. It prevents spectrum warehousing by avoiding the need to reserve either spectrum or orbital resources for systems that may never launch. Finally, it aids systems in obtaining landing rights around the world, and in coordinating with non-U.S. licensed systems.

Moreover, the objections to Option III raised by certain parties are all based on significant misconceptions regarding that proposal. First, neither lengthy studies nor negotiations are required to implement this approach. Therefore its adoption will not delay licensing or implementation. Second, Option III does not significantly increase operational complexity or impose system design constraints. As explained by Teledesic in its comments, all of the system capabilities required for Option III will already need to be incorporated into the proposed systems. The increased complexity and cost of Option III is marginal (if it exists at all), and more than compensated for by the increase in spectrum usage it allows.

As the comments demonstrate, the other options proposed in the NPRM -- Options I, II and IV -- suffer from a number of flaws. Chief among these are that they:

(1) fail to provide licensees certainty that they will have equal access to sufficient spectrum to support economically-viable broadband services; (2) encourage spectrum warehousing; (3) minimize or eliminate opportunities for more efficient coordination; and (4) impose design constraints on the systems that would impede the provision of innovation services and competition among systems.

For the above reasons, the Commission should proceed expeditiously to adopt Option III for sharing among Ka-band NGSO FSS systems.

TABLE OF CONTENTS

	PAGE
SUMMARY.....	i
TABLE OF CONTENTS	iii
I. INTRODUCTION	1
II. SPECTRUM SHARING OPTIONS.....	2
A. Options I and II – Flexible and Dynamic Band Segmentation	2
B. Option IV – Homogeneous Constellations.....	5
C. Option III – Avoidance of In-Line Interference Events	8
CONCLUSION.....	12

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SkyBridge L.L.C. ("SkyBridge"), by its attorneys, hereby replies to the comments filed in response to the Notice of Proposed Rulemaking ("NPRM") by various parties on April 3, 2002 in the above-captioned proceeding.¹ This proceeding will develop the service rules for non-geostationary satellite orbit ("NGSO") Fixed-Satellite Service ("FSS") systems in the Ka-band, including the rules for frequency sharing among the multiple applicants for such systems.

I. INTRODUCTION

The Commission has proposed four alternative frameworks for NGSO/NGSO sharing. The comments in this proceeding demonstrate that, while each of the proposals has certain arguable advantages and disadvantages, only Option III squarely meets all of the Commission's stated objectives in this proceeding. The other options suffer from a number of substantial flaws. Chief among these are that they: (1) fail to

¹ FCC 02-30, rel. Feb. 6, 2002 (the "NPRM"). See Comments of SkyBridge ("SkyBridge Comments"); Comments of Teledesic LLC ("Teledesic Comments"); Comments of Hughes Communications, Inc., ("Hughes Comments"); Comments of TRW Inc. ("TRW Comments"); Comments of @contact LLC ("@contact Comments").

provide licensees certainty that they will have equal access to sufficient spectrum to support economically-viable broadband services; (2) encourage spectrum warehousing; (3) minimize or eliminate opportunities for more efficient coordination; and (4) impose design constraints on the systems that would impede provision of innovative services and competition among systems.²

II. SPECTRUM SHARING OPTIONS

A. Options I and II – Flexible and Dynamic Band Segmentation

The commentors in this proceeding rejected Options I and II, as described in the NPRM, which involve alternative methods of segmenting the available bands of spectrum among the applicants in this proceeding. First, these options would not provide the licensees regulatory certainty that they would have access to nearly enough spectrum

² As in its earlier comments in this proceeding, SkyBridge does not distinguish between first and second round licensees, but discusses sharing options in terms of their ability to equitably accommodate all proposed NGSO FSS systems. As noted by many of the commentors in this proceeding, it appears that the sole first round licensee, Teledesic, has lost any priority *vis-à-vis* the second round applications to which it previously might have been entitled. See SkyBridge Comments at 3, n.13; Hughes Comments at 11-17; TRW Comments at 3; @contact Comments at 4-7. In any case, the recent modification request filed by Teledesic makes it clear that Teledesic has not progressed far in the construction of its system, and has significant flexibility at this stage to share equally in the burden of coordination with new entrants, as the Commission has stated it would require in the event of a significant alteration of Teledesic's system design. See In the Matter of Teledesic Corporation Petition for Clarification And/Or Reconsideration, Memorandum Opinion and Order, CC Docket No. 92-297, rel. Feb. 6, 2002, ¶ 9; see also, NPRM, ¶ 14. Moreover, Teledesic acknowledges that, even with priority, it has an obligation to coordinate in good faith with the other applicants, which may involve taking steps to accommodate the other systems. Teledesic Comments at 16. Finally, Teledesic argues that implementation of Option III, Teledesic's preferred approach, adds only marginally to system cost and complexity. Teledesic Comments at 23. For these reasons, whether or not Teledesic retains any formal priority as a first round licensee, the Commission should require it to participate in implementation of Option III on an equal footing with the second round applicants.

for economically-viable broadband systems.³ Second, these options introduce the likelihood that the spectrum available to a given licensee actually would decrease with time, counter to business requirements.⁴ Moreover, these approaches may create insurmountable problems in coordinating with systems licensed by other administrations.⁵ As noted by Hughes, these options also would result in a reduction of usable spectrum, due to the need for numerous guard bands, and would limit carrier sizes and access methods.⁶ The Commission should therefore reject these options.

@contact proposes a variation of Options I and II, which appears similar to that proposed by Boeing in the Ku-band proceeding.⁷ Under @contact's approach, each system would be licensed for all of the spectrum, but would have primary status only within its reserved piece of spectrum, and would have secondary status (vis-a-vis other NGSO licensees) in the remaining frequency bands allocated to NGSO FSS systems.⁸ Although superior to Options I and II, @contact's alternative does not solve several of the significant problems introduced by these options.

First, @contact's proposal does not guarantee sufficient spectrum for each system. As with Options I and II, a system would likely have to coordinate with its other NGSO operators in order to gain access to bandwidth adequate to support a broadband system. This is because, in this context of competing systems, each operator could have a

³ See SkyBridge Comments at 6,8; Hughes Comments at 3, 10; TRW Comments at 2.

⁴ See SkyBridge Comments at 6,8; Hughes Comments at 2, 4; TRW Comments at 11.

⁵ See SkyBridge Comments at 7,8; Teledesic Comments at 6, 10-11.

⁶ Hughes Comments at 3-4.

⁷ Comments of The Boeing Company, IB Docket No. 01-96, July 6, 2001, at 3.

⁸ @contact Comments at ii, 2, 9.

strong disincentive to allow sharing of its "primary" spectrum, particularly by a competitor.⁹ Although technically, the primary operator's permission would not be required for another system to enter the band on a secondary basis, in practice, endless disputes regarding interference to primary systems most likely would result. The need for prior coordination to prevent such disputes could only be overcome via the development of detailed and quantitative rules defining the protection requirements of the primary operators, and the limits to be imposed on secondary operators to meet those requirements. Development of rules sufficient to avoid the need for coordination and to prevent disputes would negate the ostensible simplicity of @contact's proposal, without making up for the spectrum inefficiencies created by rigidly assigning each system a slot of "primary" spectrum.¹⁰ Most importantly, it would thwart @contact's primary justification for its proposal, *i.e.*, to permit the Commission to immediately issue licenses without the need for any additional study or negotiation among the applicants.¹¹

⁹ As SkyBridge explained in its comments, granting exclusive rights to individual operators is simply an invitation to those operators to protect those rights, to the detriment of its competitors. SkyBridge Comments at 6. See also Teledesic Comments at 6. As the Commission well knows, the same result can be expected with the grant of primary status.

¹⁰ The central flaw in @contact's proposal may be the unstated assumption that each system would have equal incentive to cooperate with its competitors, thereby facilitating sharing. Put another way, if System A needs access to System B's spectrum, System A will see a reciprocal access agreement is the logical solution. However, if System B does not need access to System A's spectrum, due to a different technical approach or business plan, the incentive for reciprocity collapses. The sharing scenario therefore cannot rely on such cooperation, but must ensure that each system has access to sufficient spectrum even if cooperation does not materialize. The beauty of Option III is that, no matter how recalcitrant one or more licensees may be, they cannot impose significant adverse consequences on their competitors.

¹¹ @contact Comments at i, 2-4, 13.

Moreover, despite @contact's claims to the contrary, band segmentation may significantly hamper operation of U.S. systems in foreign countries.¹² Because segmentation is a substitute for implementation of generic interference mitigation techniques, the U.S. systems could experience substantial difficulty accepting the sharing burden in the coordination process with a foreign system, putting in jeopardy their global operations.¹³

Due to these uncertainties, @contact's proposal could drastically impede financing of these NGSO systems. Particularly in light of market's experience over the past two years, financial institutions are very sensitive to the consequences of even a seemingly unlikely default scenario.¹⁴ The fact that, under the @contact proposal, each licensee could claim primary access to only $1/N$ of the spectrum (N being the number of NGSO licensees), it is very likely that the market will assume that this represents the actual amount of spectrum a system will be able to productively use. This alone could thwart investment in these systems.

Therefore, both the operational and economic impact of the @contact proposal could be quite severe. As shown below, these disadvantages are all overcome by Option III. Therefore, the Commission should decline to adopt @contact's proposal.

B. Option IV – Homogeneous Constellations

The majority of the applicants in this proceeding also reject Option IV, which would require them to abandon their current system designs, and, in some cases,

¹² @contact Comments at 11-12.

¹³ See SkyBridge Comments at 10; Teledesic Comments at 12.

¹⁴ See TRW Comments at 10; see also Hughes Comments at 25-26.

their business plans.¹⁵ Of the parties commenting in this proceeding, only Hughes supports enforced homogeneity. Hughes argues that most of the applicants propose MEO constellations, and therefore the Commission should mandate a MEO orbit, the specific parameters of which would be determined by the applicants via negotiation.¹⁶

However, as SkyBridge has demonstrated on numerous occasions, no orbit is inherently superior to any other orbit.¹⁷ Each class of constellations has perceived advantages and disadvantages in the marketplace, depending on the business objectives of its proponent. Restricting the technologies that can be employed will restrict the kinds of services that can be offered and the competition among providers. It could also hamper efforts to compete against other broadband technologies, particularly terrestrial-based services.¹⁸ SkyBridge therefore urges the Commission to reject this approach.

Moreover, the Hughes proposal will delay licensing and involve the Commission in lengthy negotiations. Even the MEO constellations proposed by various applicants differ in significant respects. As Hughes states, a standard orbit will need to be agreed to by all the applicants prior to licensing. Such negotiations, which will require

¹⁵ SkyBridge Comments at 9-11; Teledesic Comments at 13-14; TRW Comments at 13-14; @contact Comments at 17-18;

¹⁶ Hughes Comments at 8, 10-11.

¹⁷ See, e.g., SkyBridge Comments at 9-10; see also TRW Comments at 13.

¹⁸ For example, the high operating altitude of a MEO system as compared to a LEO system increases transmission delay, which in turn impedes interactive applications, making it difficult for such systems to compete with land-based systems, which do not suffer such delays. The increased delay could also impede use of TCP/IP-*transparent* architectures. Thus, the increased delay not only irreparably decreases the quality of some highly-interactive services, but it also increases the complexity of the system needed to support important and basic communications protocols used in even less interactive applications.

parties to make significant changes to their systems, and in some cases their business plans, will not be easily or quickly concluded.¹⁹ As the Commission has seen in the Mobile Satellite-Service context, sharing negotiations can drag on for years, and inevitably require the need for Commission participation as mediator.²⁰

Finally, homogeneity is not required in order to license all the systems in this proceeding. All the systems, including the Hughes system, can be accommodated effectively and efficiently under Option III. The Hughes system in particular has the ability to share with other types of systems under this approach, and does not require homogeneity. Moreover, Option III does not preclude applicants from reaching voluntary, bilateral agreements for coordinated orbits to mitigate against in-line events between their systems.²¹

As the Commission proposed in the NPRM, the marketplace should decide the technologies and services of Ku-band NGSO FSS systems. Each of the proposed systems has advantages and drawbacks, and none is inherently superior or more suitable according to any of the Commission's stated policy objectives in this proceeding.

¹⁹ See @contact Comments at 18. Such negotiations enable any applicant that is not interested in proceeding expeditiously (because, e.g., of anti-competitive reasons or because its funding is not secure) to unilaterally delay the progress of all other systems.

²⁰ Moreover, Hughes' proposal, which is tantamount to orbit-planning, is directly contrary to the international approach to NGSO systems taken by the ITU-R working groups. Internationally, consistent with longstanding U.S. positions, all NGSO orbits are treated identically from a regulatory standpoint. Hughes has offered no compelling reason for the U.S. to abandon its leadership role in these ITU fora and suddenly favor orbit planning.

²¹ See @contact Comments at 17-18.

A variety of constellation designs will lead to the greatest diversity in service offerings, and the highest competition among providers.

C. Option III – Avoidance of In-Line Interference Events

Today, April 18, 2002, the Commission voted at its public meeting to adopt a Report and Order in IB Docket No. 01-96, establishing Option III as the basis for coordination among Ku-band NGSO FSS systems. There is no basis whatsoever for adopting a different regime for Ka-band NGSO FSS systems, and, as noted supra, the majority of commentors in this proceeding concur that Option III provides the most effective and spectrum efficient means for sharing among the proposed systems.²²

²² SkyBridge Comments at 11-18; Teledesic Comments at 4, 11-13; TRW Comments at 4. Although TRW labels its approach a “hybrid” of Option III and other approaches, TRW’s proposal appears to describe Option III in all fundamental aspects.

TRW proposes Option III with the addition of “frequency isolation” in circumstances where in-line events could not be avoided through use of satellite diversity, for example. TRW Comments at 4-5. According to SkyBridge’s understanding of Option III, frequency isolation during in-line events is, in fact, already the default mechanism for implementing Option III. Use of satellite diversity or other mechanisms to avoid in-line events would be optional approaches that systems could elect to employ to reduce the cost of their sharing burden. Moreover, it appears that all the applicants in this processing round have the ability to implement satellite diversity, which should make the need for frequency isolation a rare occurrence.

TRW also proposes that the Commission require applicants to harmonize certain system parameters, to enable reduction of the angular separation used to define an in-line event. TRW Comments at 6. This too is consistent with Option III. In Ku-band proceeding, SkyBridge explained how harmonization of power levels could simplify selection of the benchmark angular separation. *See Ex Parte* of SkyBridge, March 27, 2001, ET Docket No. 98-206 (“March 27, 2001 SkyBridge *Ex Parte*”), at 13. In the end, however, SkyBridge believes that such harmonization is not necessary in either the Ku-band or Ka-band proceeding, and its implementation would lead to much negotiation and delay. In the Ku-band proceeding, SkyBridge presented an approach that would employ two different angular separations, depending on the parameters of the systems experiencing an in-line event. *See Ex Parte* of SkyBridge, January 31, 2002, IB Docket No. 01-96 (“January 31, 2002 SkyBridge *Ex Parte*”), at 21-24. This approach could also be used in the Ka-band, if necessary (the systems in the Ka-band proceeding are already more harmonized than in the Ku-band). As

Option III leaves all operators free to use all of the spectrum for as much of the time as possible, requiring coordination and mitigation measures only during "in-line" events. In contrast, Options I and II decrease the amount of spectrum each operator can use, even when no interference would result from each system using the full band.²³ Option III also permits the technologies used and services provided to be dictated by the market, and not by the Commission.²⁴ It prevents spectrum warehousing by avoiding the need to reserve either spectrum or orbital resources for systems that may never launch.²⁵ Finally, it aids systems in obtaining landing rights around the world, and coordinating with non-U.S. licensed systems.²⁶

The parties that opposed Option III base their objections on a number of significant misconceptions regarding that proposal.

@contact argues that implementation of Option III would require extensive study and negotiation to determine the definition of "in-line event," thereby

discussed below, however, it must be emphasized that, with Option III, there is no need to find the "perfect" or "optimum" angular separation between each system. Even if angular separations are selected that are overly conservative with respect to some systems, spectrum efficiency is still vastly greater than under any other technology-neutral sharing solution. And in any case, system operators will be free to enter into bilateral agreements to avoid in-line events between their systems (e.g., by homogenization, or simply by use of an agreed schedule of satellite diversity) or to reduce the angular separation trigger between their systems (e.g., by harmonization, or simply by computing the optimum angular separation between their systems). There is no reason whatsoever to force operators to change their system design under Option III.

²³ SkyBridge Comments at 11; Teledesic Comments at 5, 11.

²⁴ SkyBridge Comments at 12.

²⁵ Teledesic Comments at 12.

²⁶ SkyBridge Comments at 10; Teledesic Comments at 12.

delaying licensing.²⁷ This is not the case. As SkyBridge has described on numerous occasions in the Ku-band proceeding, with Option III there is no need to find the “optimal” angular separation between each system, as @contact seems to believe.²⁸ In fact, the selected angle can be rather arbitrary. A simple default angle that is sufficient to protect systems from interference is sufficient. Even if this angular separation is overly conservative with respect to some or even many of the systems, spectrum efficiency is still vastly greater than under any other technology-neutral sharing solution. And in any case, the default angle adopted by the Commission is really just a starting point. Post-licensing, system operators will be free to enter into bilateral agreements to avoid in-line events between their systems or to reduce the angular separation trigger for their systems. Therefore, Option III facilitates expeditious licensing.

Hughes argues that Option III entails a “significant increase in system and user terminal complexity and increased inter-system coordination.”²⁹ Hughes points to the need to employ handoffs to another satellite or frequency isolation during in-line events. As pointed out by Teledesic, however, “most of the capabilities required to implement Option III are necessary anyway.”³⁰ Hand-offs between satellites are inherent to NGSO FSS systems, and this capability already has to be incorporated in all of the proposed systems. Furthermore, because these systems must coordinate with a number of U.S. and non-U.S. systems, the capability of ceasing transmissions in specific frequency

²⁷ @contact Comments at 13-17.

²⁸ @contact Comments at 15, n.35, 16. See, e.g., March 27, 2001 SkyBridge *Ex Parte* at 11-13; January 31, 2002 SkyBridge *Ex Parte* at 17-19.

²⁹ Hughes Comments at 5.

³⁰ Teledesic Comments at 23.

segments at specific instances must also be incorporated into these systems. As concluded by Teledesic, implementation of Option III adds only marginally to system complexity, and, this marginal cost is exceeded by the benefit of more intensive spectrum use.³¹ Even if a system does not have the capability to perform satellite diversity all of the time, it is preferable that it have a frequency reduction for a small percentage of time (during in-line events) than all of the time (as is the case under band segmentation).

Arguing that Option III becomes more complicated when LEO systems are taken into account, TRW states that “it would be appropriate to limit the amount of spectrum available to a LEO system based either on the total number of systems deployed or upon the ratio of satellites in an operational LEO system to the average number of satellites in the operating MEO systems.”³² There is absolutely no justification for such a measure. TRW points to only the greater number of satellites employed by LEO systems, while ignoring other factors, such as the shorter duration of LEO system in-line events. Moreover, the precedent would be far-reaching. In the Ku-band, for example, HEO systems complicate sharing due to their relatively high uplink power levels. According to TRW’s rationale, those systems should be penalized. However, in that band, SkyBridge has proposed sharing methods that would avoid penalizing such systems.³³ The great advantage of Option III is that it can accommodate all system architectures, leading to the greatest diversity in services. Penalizing certain kinds of systems in any way would negate this benefit, and harm competition among systems.

³¹ Teledesic Comments at 23.

³² TRW Comments at 7, n.5.


³³ January 31, 2002 SkyBridge *Ex Parte*, at 21-24.

CONCLUSION

In order to foster the provision of innovative satellite broadband services to all Americans, the Commission should license all of the applicants in the current Ka-band NGSO FSS processing round. This should be accomplished in a manner that provides business and regulatory certainty that all licensees will enjoy equal opportunities to build and launch their systems, as designed in accordance with their individual business plans, with access to sufficient spectrum for broadband applications. Of the Commission's proposals in the NPRM, only Option III meets these important goals, and SkyBridge urges the Commission to proceed expeditiously to adopt that approach.

Respectfully submitted,

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